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apparatus for transferring the reserve starch of the perisperm to the embryo. He suggests that in several genera of Cannaceæ, Polygonaceæ, Phytolaccaceæ, Caryophyllaceæ, and others, a thin layer of endosperm separating perisperm and embryo may serve the same function.

J. A. HARRIS.

**The Origin of Monocotyledons.**—The importance of a study of the seedling stages of plants in classification is being much emphasized of late. In a recent number of this Journal, Professor Campbell (*Am. Nat.*, Vol. XXXVI, pp. 7–12, January, 1902) touches on this question. In a more recent number (*Am. Nat.*, Vol. XXXVI, pp. 981–982, December, 1902) was reviewed the preliminary paper of Miss Sargent in which she announced a theory of the origin of the Monocotyledons from a dicotyledonous type. In the following number of the *New Phytologist*, (Vol. I, pp. 131–133, June, 1902) Tansley commends very highly in some ways the paper by Miss Sargent, but calls attention to the freedom with which the hypothesis of the derivation of a simple structure from a more complex one is nowadays used in morphological work, and to the danger of the too free use of this hypothesis in biological speculations, unless the special conditions determining the reduction are to be ascertained, since there seems to be no reason for believing that there is any general cause leading to reduction as compared with the primary tendency to increase in bulk and complexity of structure. He thinks that, while of the greatest interest in many ways, the generalized conclusions of Miss Sargent's paper should not be accepted without careful consideration.

In the current number of the *Annals of Botany*, Miss Sargent<sup>1</sup> presents in greater detail the theory recently announced, though she states that the evidence she has accumulated will not be published in detail until her monograph on the comparative anatomy of seedlings of the Liliaceæ is completed. In the opening pages she discusses the nature of the evidence employed in formulating her theory, This is followed by observations on the anatomy of seedlings, occupying nearly sixty pages, and considering the tribes Scilleæ, Tulipeæ, Asphodeleæ. Allieæ, Dracæneæ, Asparageæ and Aloineæ of the Liliaceæ, to which her work has been principally confined, with fewer examples from the Amaryllidaceæ, Iridaceæ,

<sup>1</sup> Sargent, E. A Theory of the Origin of the Monocotyledons, founded on the Structure of their Seedlings, *Ann. of Bot.*, Vol. xvii, pp. 1–92, Pl. I–VII, January, 1903.

Aroideæ, Palmeæ and Scitamineæ, of the monocotyledons and the Ranunculaceæ of the dicotyledons. In the third part she takes up general considerations on the origin of the monocotyledons.

In the space of a review, it is necessarily impossible to state in detail the evidence presented, but some of the main points of argument may be given. As in her previous paper she affirms her belief in the real systematic value of some of the vascular characters of the young seedling—at least of the Liliaceæ—and emphasizes the structural similarity of some of the Ranunculaceous seedlings to those of certain forms which she concludes represent the primitive type of vascular arrangement in the Liliaceæ. She expresses her belief in the genetic connection of *Eranthis* and *Anemarrhena*, but even if there be no historical connection, she maintains that the structure of *Eranthis* may illustrate the double origin of the *Anemarrhena* cotyledon. Two tables are given, one listing dicotylodenous seedlings with a well-marked cotyledonary tube and the others those in which the union of the cotyledons occurs along one margin only. The ecological relations of these seedlings are discussed in relation to their bearing upon the development of a permanent monocotyledonous type, and it is found that almost all belong to plants of geophilous habit and that in some cases the whole structure remains under ground during the first year of their growth, developing underground organs for the tiding over of the unfavorable vegetative period to follow. Such considerations have led her to regard the monocotyledon as an organism adapted primarily to a geophilous habit, and she thinks that when considered from this point of view many puzzling details of structure in the monocotyledons become comprehensible. A brief discussion of some of these points is given. A bibliography of forty-five titles lists the literature to which reference is made.

While the presentation of the theory is confident, it is not without due reserve. "The evidence is obviously incomplete. The theory itself cannot be considered as proved in any sense. It is brought forward as a working hypothesis which I have found in practice to be suggestive and illuminating." The favorable tone of the present review may be attributed to the desire of the reviewer to present the theory from the point of view of the one who proposes it, but no one will deny that the data presented in the paper is of the greatest value and that the theoretical considerations will receive the careful attention of botanists and be of importance in the elucidation of the great problem, to the solution of which the paper is an important contribution.

A recent paper by Mr. Lyon,<sup>1</sup> whose work on the embryogeny of *Nelumbium* has been a stimulus to work of this nature, has apparently not come to the notice of Miss Sargent. This paper considers primarily not the origin of the monocotyledons and dicotyledons but the origin of the cotyledon itself. His conclusions are of such interest, and part of them so directly connected with the questions with which Miss Sargent's paper is concerned that it seems well to state them briefly. Of the three elements, cotyledon, stem and root of the typical embryo of the pteridophytes and angiosperms, the cotyledons do not represent modified leaves, but are primarily haustorial organs, originating phylogenetically as the nursing foot in the Bryophytes and persisting in the higher plants. Thus the monocotyledonous condition occurring in the bryophytes, pteridophytes, and Monocotyledons is to be regarded as the primitive one while the two or sometimes more cotyledons of the dicotyledons are the homologues of the single cotyledon of the monocotyledons.

J. A. HARRIS.

**French Forestry.**<sup>2</sup> — Despite the different conditions under which French and American foresters have to work, Professor Mouillefert's *Traité de Sylviculture*, the first part of which has just appeared, is well calculated to be of much service even in this country. The remaining three volumes of the series are in press and are promised for the current year.

The bulk of the present volume is devoted to detailed accounts of the principal species both native and foreign with which French forestry is concerned. Each is described and illustrated by remarkably good figures showing commonly the winter habit, twigs with buds, the leaves, inflorescence, flowers, fruit, seeds, germination and wood. Reference is made to the geographical distribution, the tree's preference as regards soil and climate, and the best methods of propagating and tending. Considerable attention is given to the wood, especially as regards distinctive structural features and economic uses. The uses of other parts is also given, as well as an account of the general economic importance of the tree, exhibited so far as possible by statistics. Finally, its more important insect enemies and vegetable parasites are mentioned and the nature and extent of the injuries they inflict briefly indicated.

<sup>1</sup> Lyon, H. E. The Phylogeny of the Cotyledon, *Poselsia*, Vol. i, pp. 57-86, 1902.

<sup>2</sup> Mouillefert, P. *Principales Essences Forestières précédées de notions de statistique forestières*. Paris, Felix Alcan. 1903. 12mo, xii + 545 pp., 630 figs.